

# Intravenous Therapy

## IV Therapy Overview

- Definitions & Indications
- Fluid Resuscitation
- Equipment and Supplies
- Choosing Fluids and Catheters
- Procedure and Technique Tips
  - Peripheral Venipuncture
  - Intraosseous Access
- Potential Complications

## Definitions

- IV / Venipuncture
- Peripheral / Central
- Intraosseous Access
- Fluid Resuscitation
- Medication Access
- Crystalloids
- Colloids
- Hypertonic
- Isotonic
- Drip Rates
- KVO / TKO

## Indications for Venipuncture

- **Volume**
  - Dehydration
    - Water
    - Electrolytes
  - Blood Loss
    - Colloids
    - Crystalloids
- **Venous Access to Circulation**
  - Blood collection
    - Labs
    - Field Chemistry
  - Medication Administration

# Fluid Resuscitation

## ■ Dehydration and Volume Loss

- Replace Lost Fluid or Blood
- Often requires 2-3 times the amount lost (2:1 rule)

## ■ Shock Management

- Controversial
- Definitive therapy = Surgery and blood replacement
- EMS → judicious replacement
- Improve end organ perfusion (BP at 90 - 100 mm Hg)

# Equipment and Supplies

## ■ Fluids

- Normal Saline (0.9% NaCl)
- Lactated Ringers (LR or RL)
- 5% Dextrose in Water (D<sub>5</sub>W)
- Other (D<sub>5</sub> 1/2 NS)

## ■ Supplies

- IV Catheters
  - Over the needle catheter
  - Thru the needle catheter
  - Hollow needle / Butterfly needles
  - Intraosseous needle

# Equipment and Supplies

## ■ Supplies (cont'd)

- Infusion Sets
  - 10 or 15 gtt/cc (large/macro drip)
  - 60 gtt/cc (small/micro drip)
  - "Select-3"
- Alcohol and Betadine
- Restricting Band
- "Tegaderm" / "Venigard"
- Tape
- Armboard (optional)
- Labels
- Saline Lock (optional)

# Choosing Fluids & Catheters

## ■ Crystalloid Fluids

- Volume replacement and  $\uparrow$  CO/BP
- Isotonic
- No proteins
- Moves into tissue over short time

## ■ Colloid Fluids

- Large proteins
- Remain in vascular space
- Blood replacement products
- Plasma Substitutes (Hypertonic)
  - Dextran
  - Hetastarch



# Choosing Fluids & Catheters

## ■ Catheters

- Over the needle preferred (or IO in peds)
- Size depends on patient's needs and vein size
- Large gauge and short length for volume replacement

## ■ Vein Selection

- For most patients, choose most distal
- Hand, forearm, antecubital space, and external jugular
- Normal Anatomy provides clues to locations
- avoid injury, fistula, mastectomy side

# Theory of Fluid Flow

## ■ $\text{Flow} = \text{diameter}^4 / \text{length}$

- Larger catheters = higher flow
- Short catheters = somewhat higher flow

## ■ Other factors affecting flow

- Tubing length
- Size of Vein
- Temperature and viscosity of fluid
  - Warm fluids flow better than cold

## Tips on Increasing Flow

- Use a large vein
  - Large AC preferred for cardiac arrest, trauma, adenosine & D50 administration
- Use a short, large bore catheter
  - 1<sup>1/4</sup> " 14 g
- Use short tubing with large drip set
  - Macro drip (10 gtts/ml) and NO extension set
- Use warm fluid with pressure infuser

## Venipuncture Procedure: Tips

- **Talk to your patient**
- Prepare & Assemble equipment ahead of time or direct this task
- Inspect fluid date, appearance, and sterility
- Flush air from tubing
- Select the most distal site if at all possible
  - antecubital
  - saphenous
  - external jugular

## Venipuncture Procedure: Tips

- Stabilize extremity
- Stabilize adjacent skin
- Remove restricting band
  - before removing needle
  - after drawing blood
- Remove needle & place in sharps
- Check for adequate flow
- RECHECK drip rate

## Venipuncture Procedure: Tips

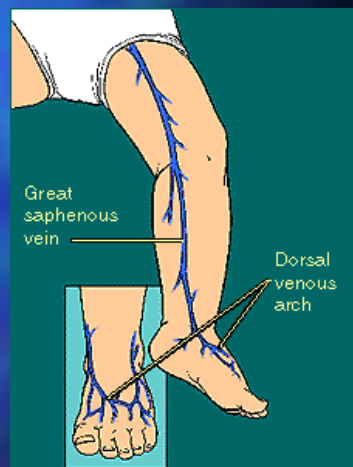
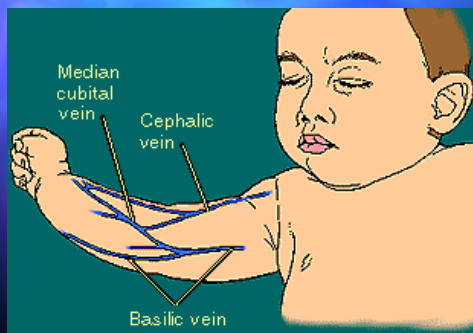


# Intraosseous (IO) Infusion & Vascular Access

- Common IV sites for Pediatric patients
  - Peripheral extremities (hand, wrist, dorsal foot, antecubital)
  - Peripheral other (external jugular, scalp, intraosseous)
  - Neonate (umbilical vein)
- Any drug or fluid that can be given IV may be given by the IO route
- Little interference during Resuscitation

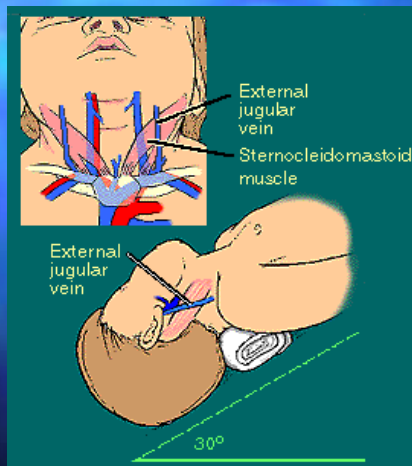
## Intraosseous (IO) Infusion

### Initial IV access sites





# Intraosseous (IO) Infusion



Potential IV sites

# Intraosseous (IO) Infusion

## ■ Indications

- Required drug or fluid resuscitation due to an immediate life-threat (e.g. CPR, Shock)
- At least 2 unsuccessful peripheral IV attempts

## ■ Contraindications

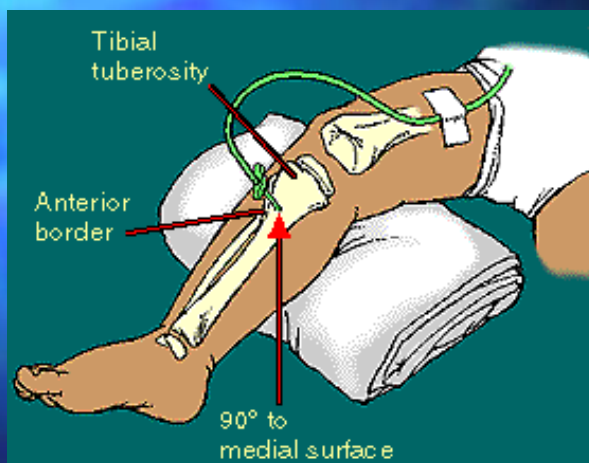
- Placement in or distal to a fractured bone/pelvis
- Placement at a burn site (relative)
- Placement in a leg with a missed IO attempt
- ↑ difficulty in patients > 6 years of age

# Intraosseous (IO) Infusion

## ■ Placement Location

- Anteromedial surface of the tibia
- Approximately 1-3 fingers (1-3 cm) below the tibial tuberosity
- generally safe location with large marrow cavity
- avoid closer locations to knee due to growth plate

# Intraosseous (IO) Infusion



# Intraosseous (IO) Infusion

## ■ Procedure

- Same as peripheral IV
- Place leg on firm surface. Locate landmarks
- Grasp the thigh and knee. Do not place hand behind insertion site.
- Palpate landmarks and identify site of insertion.
- Clean site if time permits

## ■ Procedure (contd)

- Insert needle at 90° angle. Apply pressure with firm twisting motion.
- Stop advancing once needle resistance is decreased
- Remove stylet.
- Inject saline. Check for resistance or soft tissue swelling.
- Connect infusion set
- Stabilize

# Intraosseous (IO) Infusion

## ■ Considerations

- Gravity flow of IV fluids will typically be ineffective. Use pressure bags if continuous infusion is required
- Fluid is best administered as a syringe bolus using an extension set or T-connector
- **PROTECT YOUR IO SITE!**

## Potential Complications

- Sepsis (infection)
- Hematoma
- Cellulitis
- Thrombosis
- Phlebitis
- Catheter fragment embolism
- Infiltration
- Air embolism